E/CONF.39/C/454
SUMMARY
3 Nov.1962
ORIGINAL : ENGLISH

UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

SUMMARY

Agenda Item: C.3.2

United States of America

TRANSFORMING IRRIGATION FROM AN AGE-OLD ART INTO A MODERN SCIENCE THROUGH RESEARCH AND TECHNOLOGY

By Robert M. HAGAN,
Chairman, Department of Irrigation,
University of California,
Davis, California

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

NOTES

1. Papers selected for inclusion in General Sessions will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

2. Papers selected for inclusion in Specialized Sessions will be available at the Conference in only one of the above official languages.

3. Summaries of all papers, as submitted by contributors, will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

4. Papers and summaries will not be available for general distribution in advance of the Conference. They will be published in advance in limited quantities only for the use of delegations of participating governments and of other authorized participants. Post-Conference publication and general distribution of the Conference Proceedings will follow United Nations practices as laid down by the United Nations Publications Board.

TRANSFORMING IRRIGATION FROM AN AGE-OLD ART INTO A MODERN SCIENCE THROUGH RESEARCH AND TECHNOLOGY

by Robert M. Hagan
Chairman, Department of Irrigation
University of California, Davis, California

1. Irrigation was extensively practiced by earliest civilizations known to man. Much of this irrigated agriculture failed because of misuse of water led to erosion and siltation, excessive leaching of soil nutrients, waterlogging, and ultimately salinity. Today the same conditions limit crop yields in extensive areas and even have caused failrue of recent irrigation projects. In some regions, food production lost through deterioration of irrigated lands may offset production from new lands brought into production under irrigation.

2. Even where development of water supplies involves construction of ultra-modern engineering structures, developed water is often conveyed through inefficient distribution systems little influenced by science and technology to farmers who continue to irrigate according to age-old practices and traditions. The modern science of irrigation, in a broad sense, seeks to increase efficiency in converting precipitation into useable water and to reduce losses in utilizing this water. Each loss represents a challenge to the irrigation scientist and engineer to find economic means for its reduction or elimination. Intelligent application of today's knowledge of irrigation science and technology can accelerate irrigation project development, achieve maximum crop production from available water, reclaim previously productive lands now waterlogged and salinized, and insure an abundant and permanently successful irrigation agriculture.

3. One important aspect of science is the ability to predict expected results in given situations. Man cannot afford time-wasting, resource-depleting, and trial-and-error approaches in irrigation. Much knowledge and methodology is now available for evaluating irrigation sites, determining suitability of irrigation waters, estimating crop irrigation requirements, predicting effects of specific irrigation practices, diagnosing drainage needs, and estimating leaching requirements to maintain favorable salt balances.

4. Irrigation practices recommended should be based on sound irrigation principles and designed specifically in accordance with prevailing soil, crop, climate, management, and economic factors. Research on crop irrigation reveals many opportunities to increase irrigation efficiencies, improve crop yields, and influence the development of plants to best serve man's needs. Cited is a severe decline in cotton production which appears to have been caused largely by traditional but inadequate irrigation practices.

5. To take full advantage of research on crop irrigation, water must be conveyed to farmers' fields and spread in accordance with crop water requirements and soil characteristics. Many countries are tolerating appalling wastes of irrigation water. The irrigation method to be used should be selected in accordance with

topography, soil, rate of water delivery, drainage hazards, crop and its consumptive use, water quality, salinity, and other considerations. The irrigation engineer must still depend partially on local experience and trial-and-error methods, but the engineer's art can now be supplemented by research which provides methods for more accurate prediction of irrigation system performance.

6. Efficient but expensive machines available to grade land for irrigation are often not suitable for developing countries. The activities of a specialist working in India illustrate opportunities to build inexpensive land grading and cultivation devices from local materials which, when used in accordance with modern technology, can greatly improve irrigation practices and crop yields on difficult soils and terrain. Examples of water control equipment produced inexpensively from local materials are given. Special shaping of beds and furrows to minimize salt damage on seedlings under irrigation is reviewed as an example of a successful combination of an age-old practice from Egypt with improvements introduced by scientific analysis.

7. Research by engineers, soil physicists, and soil chemists has now produced effective means for analyzing causes of drainage problems, predicting required capacities, selecting optimum depth and spacing of drains, and computing amounts of leaching water to maintain favorable salt balances.

8. A study of waterlogging and salinity problems of the Indus River Plain provides a striking example of modern science and technology applied to solutions of complex irrigation and drainage problems. By using mathematical models and high-speed digital computers, new solutions to this old problem are proposed. These new techniques permit rapid consideration of many hydro-agronomic conditions and technical possibilities. These techniques are not merely problem-solving tools; they are even more useful for problem-identification. They provide irrigation specialists with valuable guidance in selecting data for planning, operations, and long-range predictions.

9. Man has within his grasp the means to insure a highly productive and permanently successful agriculture if full advantage is taken of opportunities now available to transform the art of irrigation into a modern science. Useful aids are monographs on irrigation, drainage, and salinity, and also an FAO-UNESCO sourcebook in preparation. Goals of better living standards in an increasingly populous world can be met more quickly by increased cooperation between irrigation engineers, soil-crop scientists, and other professional groups whose combined efforts are needed to attain a permanently successful irrigation agriculture.

S - 1584 E - Nov.1962 - 1,600